

Condition and Needs of Michigan's Bridges

Presented to:
Citizen's Advisory Committee

May 2, 2008

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Bridge Major Elements



Deck

Superstructure

Substructure

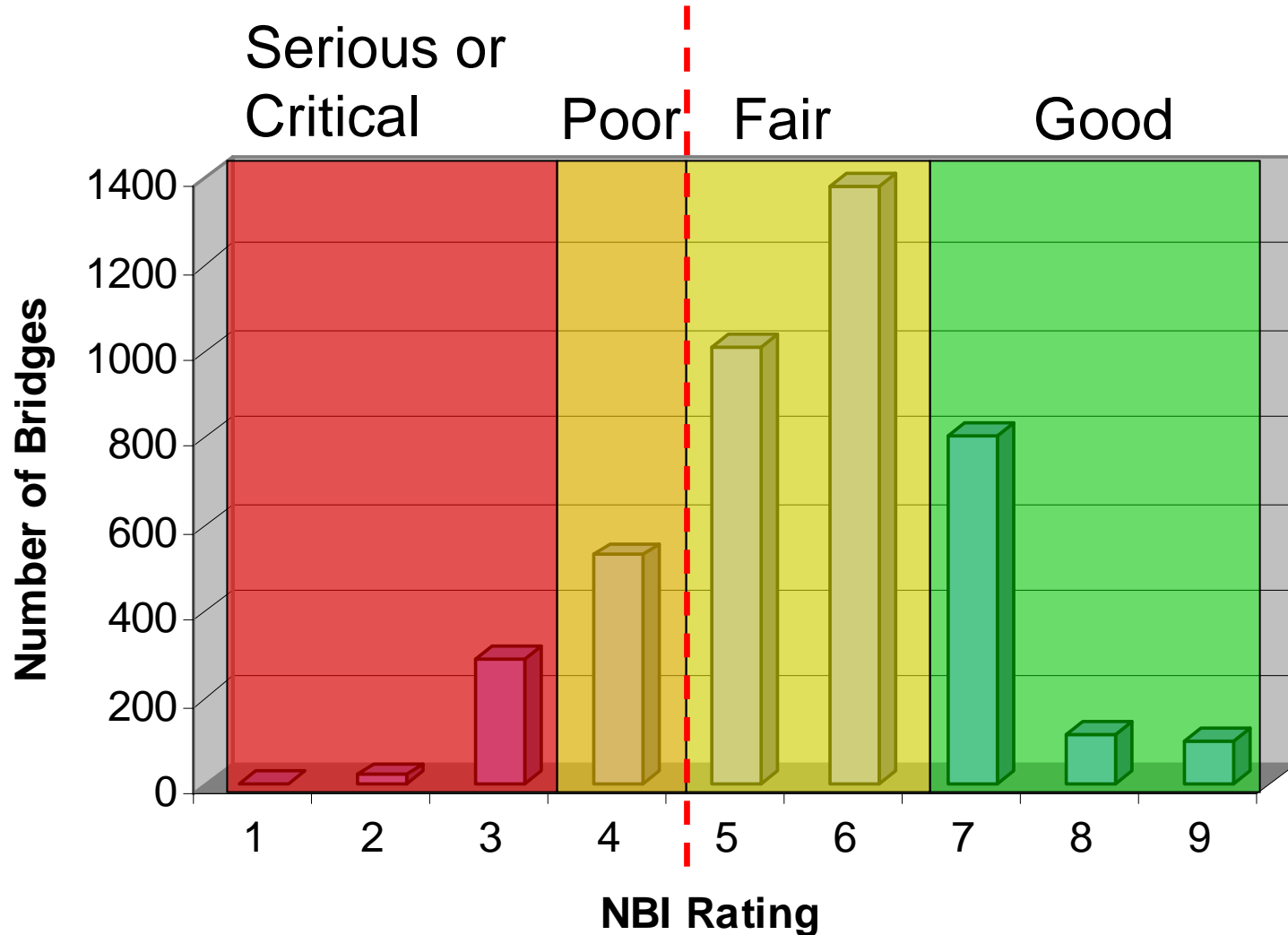
Bridge Ratings

Overall bridge condition determined by National Bridge Inventory (NBI) condition ratings (0 to 9 rating scale) for major elements; deck, superstructure, and substructure.

- If any of the 3 major elements are rated poor (4 or below), the bridge is considered poor or Structurally Deficient.

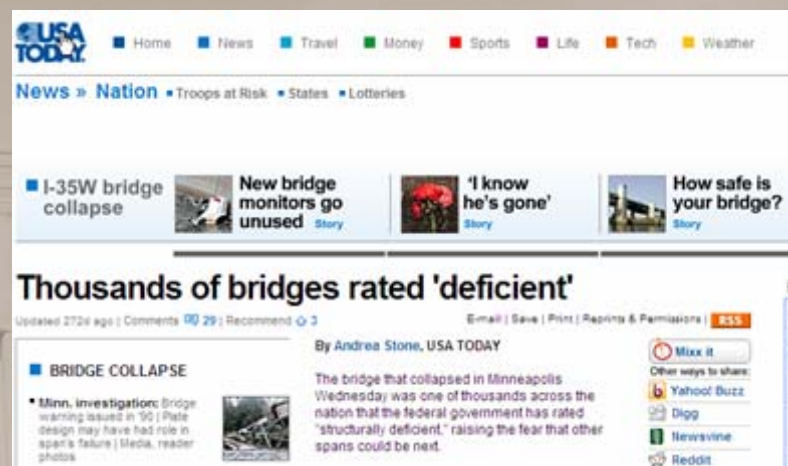


Bridge Condition Ratings



Structurally Deficient

- Any of the three major bridge elements are in poor or worse condition
- The bridge has substandard load carrying capacity
- Bridge approach roadway is submerged during flood event



Functionally Obsolete

- Load carrying capacity is less than standard
- Bridge width is less than standard
- Bridge under-clearance is less than standard
- Bridge approach roadway is submerged during flood event
- The bridge approach alignment is narrower than the highway (away from the bridge)

Organizational Structure of Bridge Inspection and Management

- The Michigan Department of Transportation (MDOT) manages state owned bridges
- Local Agencies (Counties and Cities) are responsible for their bridges



Bridge Count

- MDOT Bridges
 - **Highway bridges greater than 20 feet long = 4,465**
 - Highway structures less than 20 feet long = 1061
 - Pedestrian Bridges = 173
 - Railroad bridges MDOT responsible for = 128
- Local Agencies Bridges
 - **Highway bridges greater than 20 feet long = 6445**
 - Highway structures less than 20 feet long = 76*
 - Pedestrian Bridges = 61
 - Railroad bridges LAs are responsible for = 253

LAs not required to collect this, so value is likely very low

Monitoring Condition by Deck Area

MDOT Bridges (Not Including Big bridges, or bridges without a valid rating)

	Bridge (NBI) Condition Rating					Condition at the beginning of the first year of the simulation.					Total
	0	1	2	3	4	5	6	7	8	9	
Number Bridges	2	0	6	205	393	1022	1542	934	222	42	4368
Deck Area	18,746	0	70,265	2,200,071	3,976,906	10,338,610	14,503,636	8,553,056	2,538,785	452,542	42,652,617
Average Deck Area	9,373	0	11,711	10,732	10,119	10,116	9,406	9,157	11,436	10,775	9,283

Local Agency Bridges (Not bridges without a valid rating)

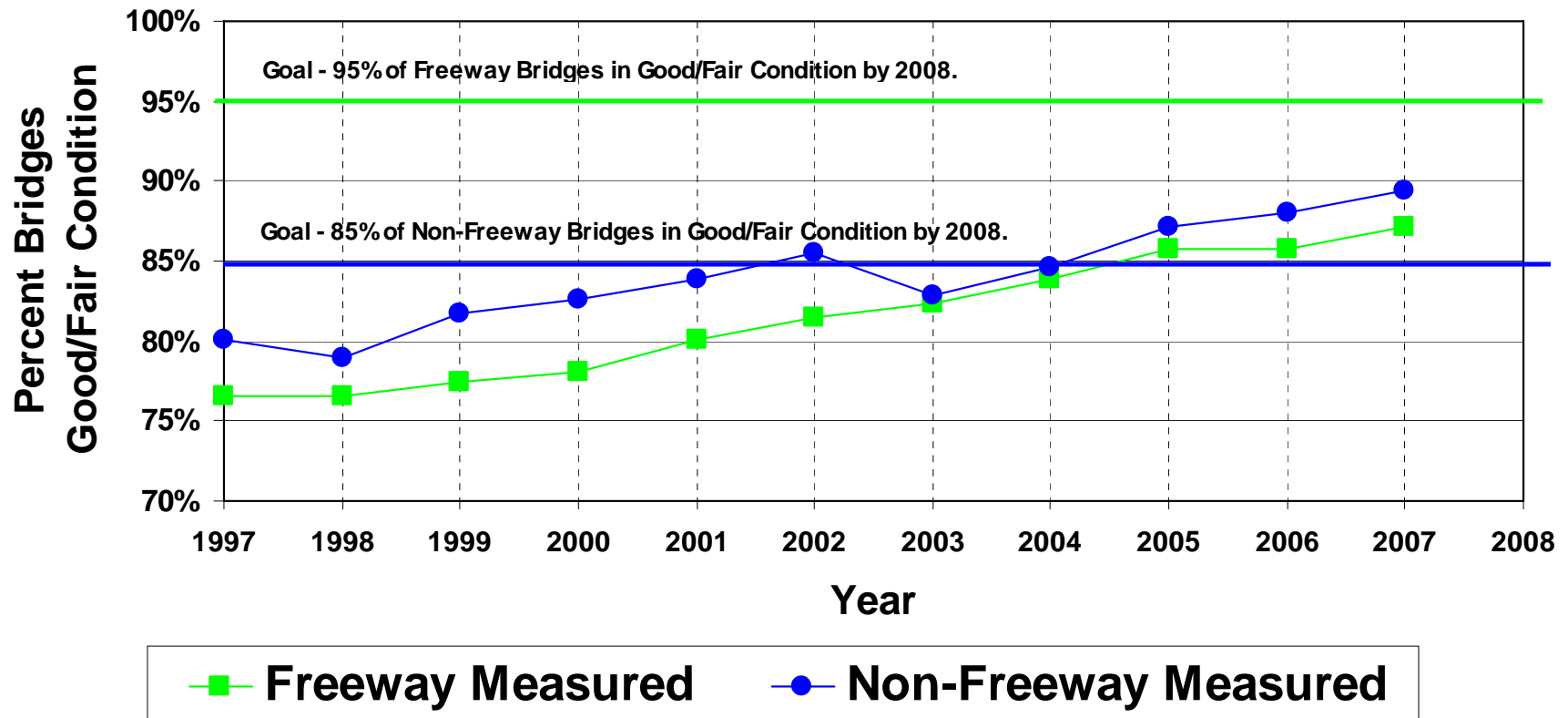
	Bridge (NBI) Condition Rating					Condition at the beginning of the first year of the simulation.					Total
	0	1	2	3	4	5	6	7	8	9	
Number Bridges	48	17	87	346	559	951	1258	1665	1293	207	6431
Deck Area	50161	18132	188708	693506	1441914	2685294	3213874	4437572	3222623	588567	16,540,351
Average Deck Area	1,045	1,067	2,169	2,004	2,579	4,804	3,379	3,527	1,936	2,843	2,535

Route Classifications Bridges Are On

Route Classification	MDOT Number Bridges	MDOT Percent	Local Number Bridges	Local Percent
Principal Arterial	2652	60%	155	2%
Minor Arterial	883	20%	521	8%
Collectors	502	11%	2566	40%
Local	408	9%	3198	50%

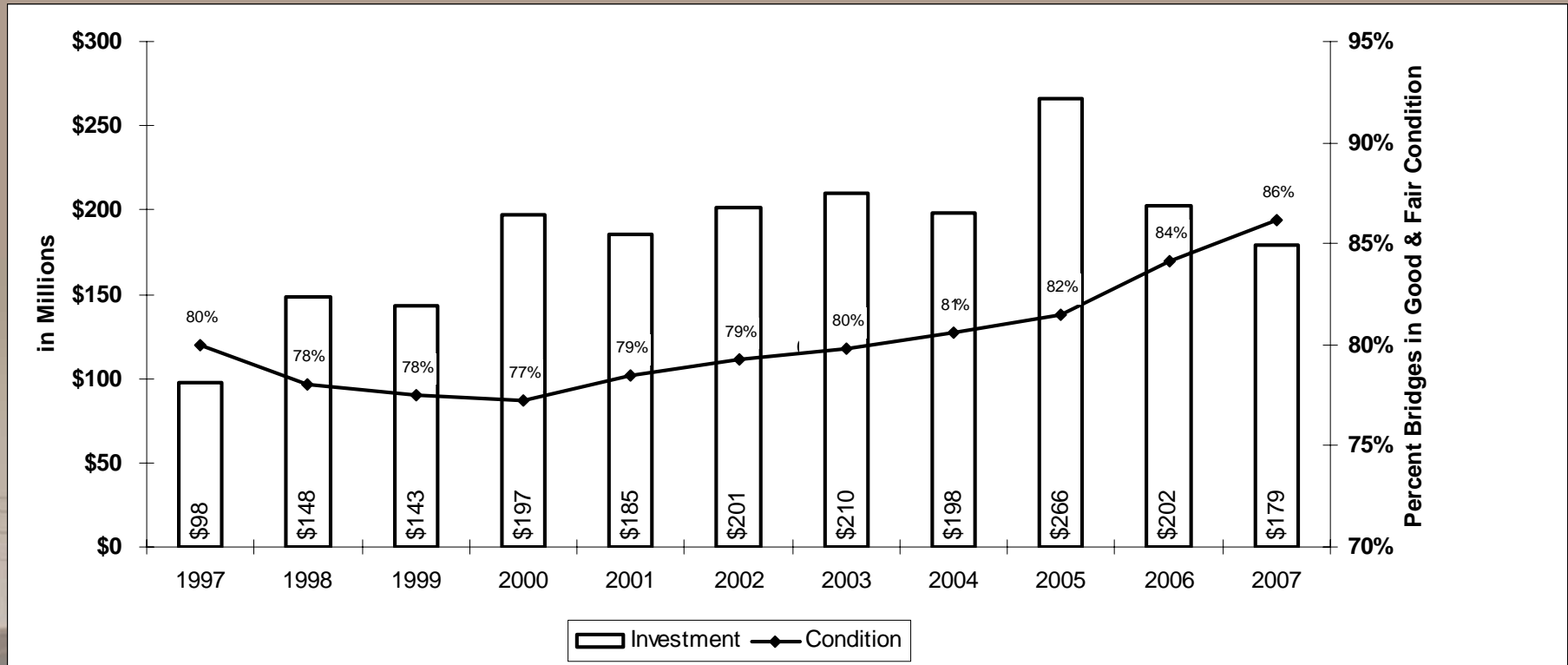
MDOT Bridge Condition Charts

Statewide - Bridge Condition



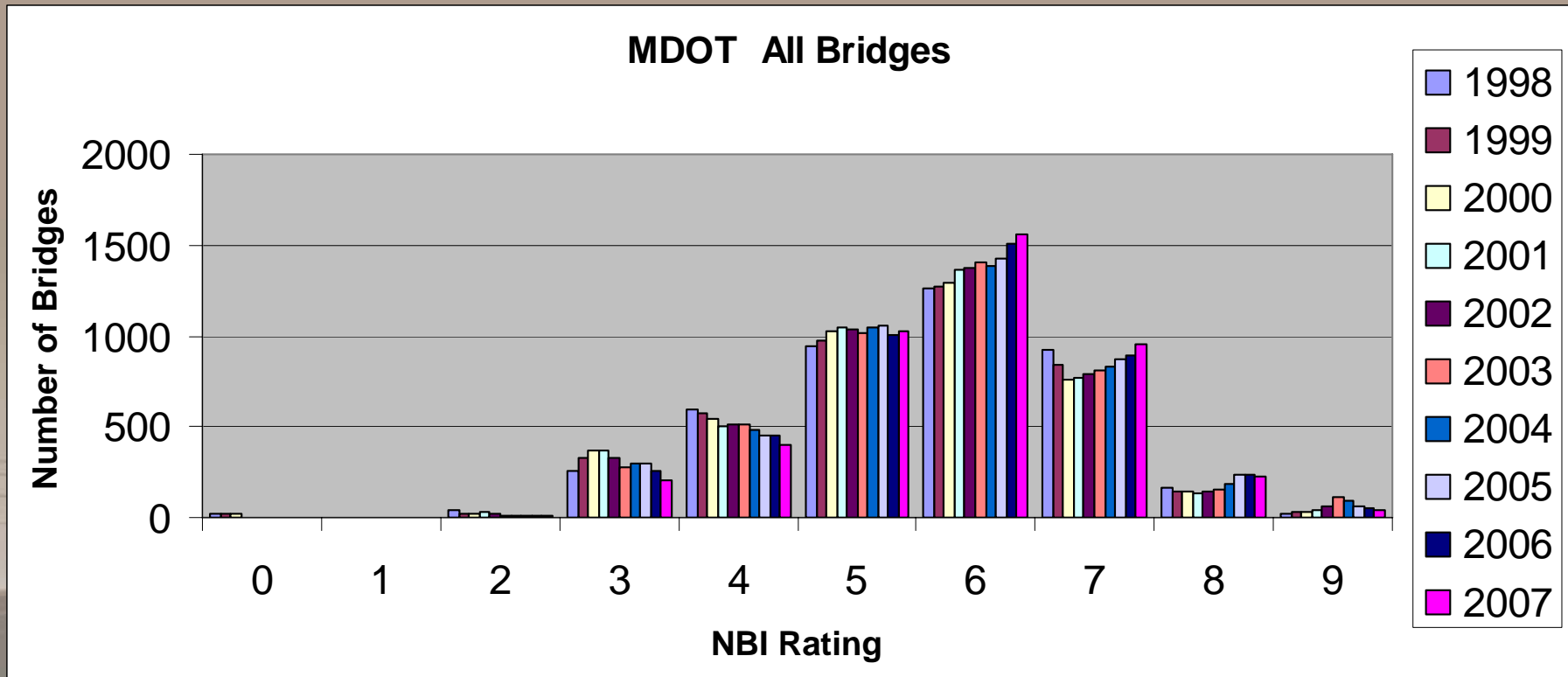
MDOT Bridges (Freeway & Non-freeway)

Condition and Investment

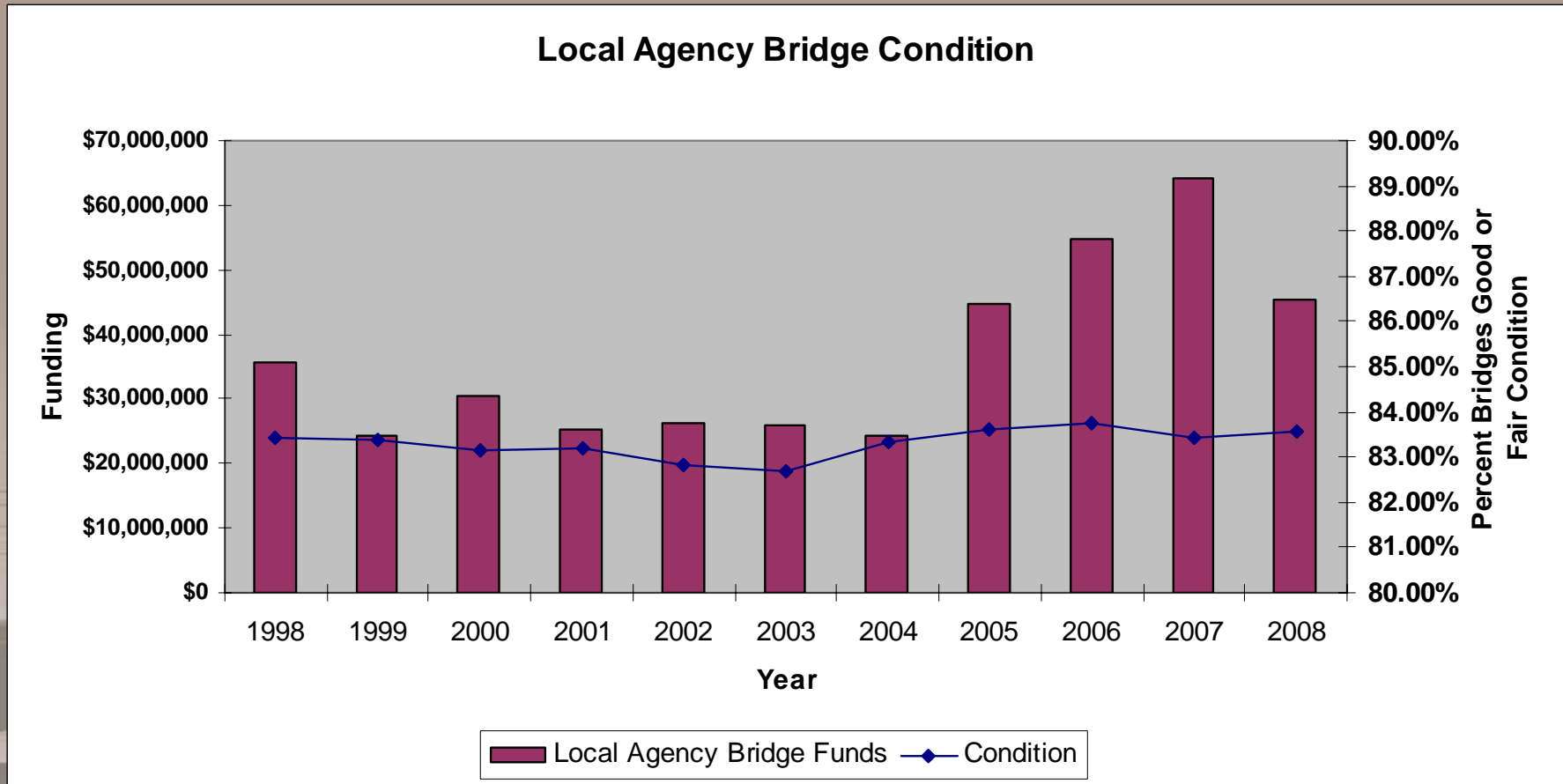


MDOT Bridges

Number of bridges in each condition rating

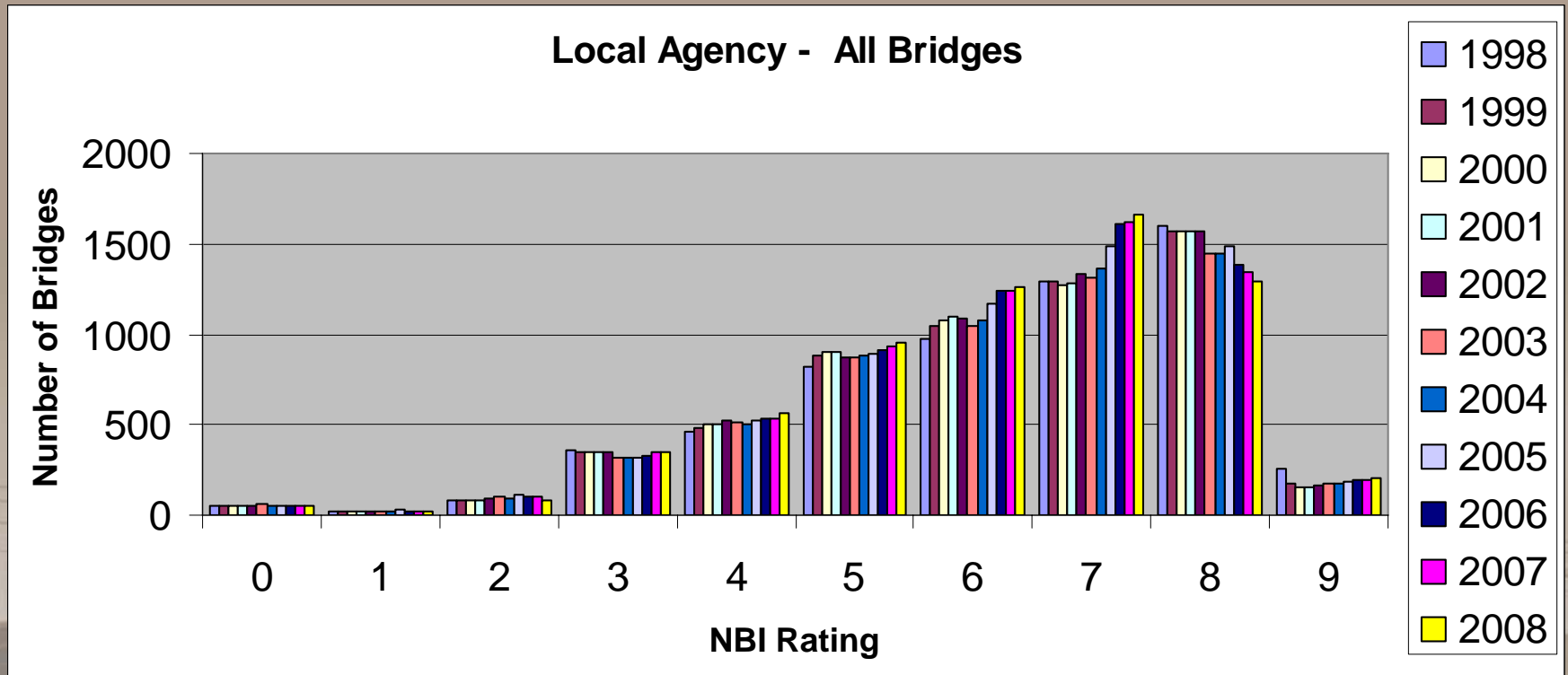


Local Agency Bridge Condition

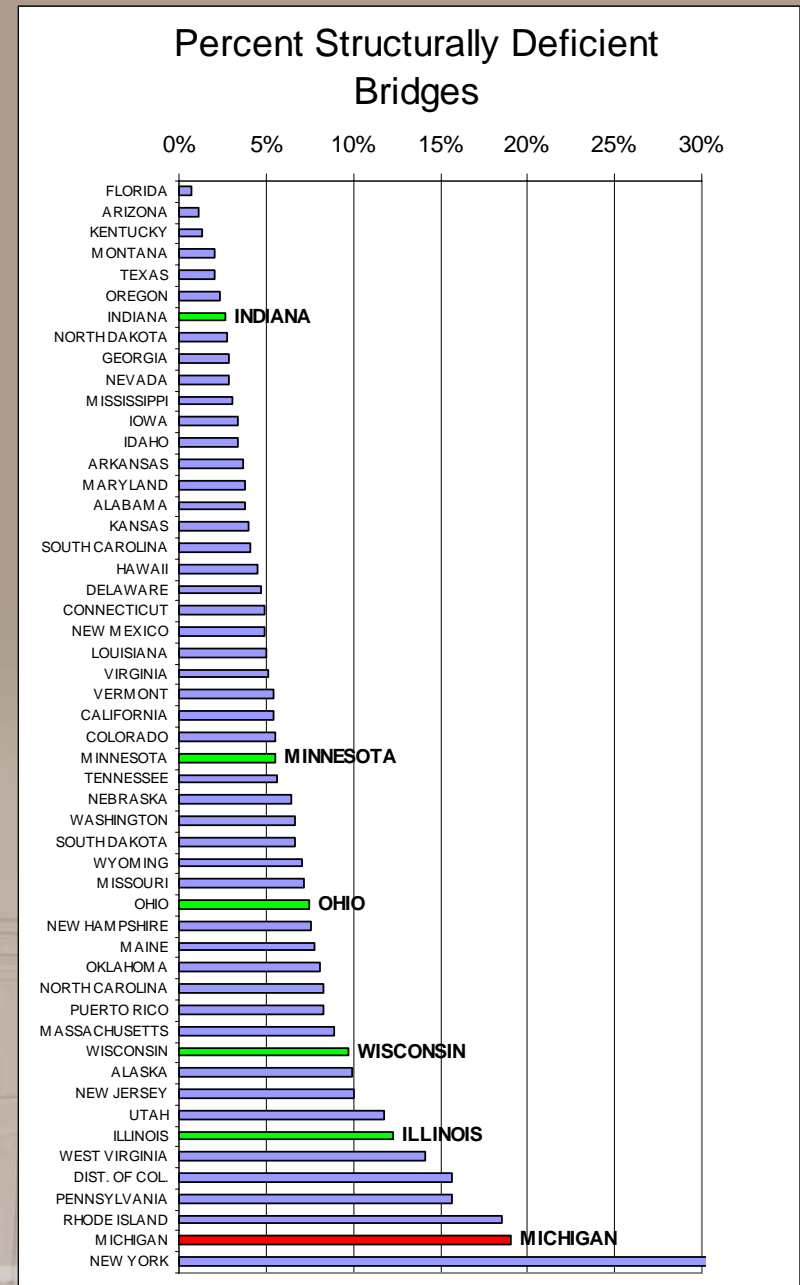


Local Agency Bridges

Number of bridges in each condition rating

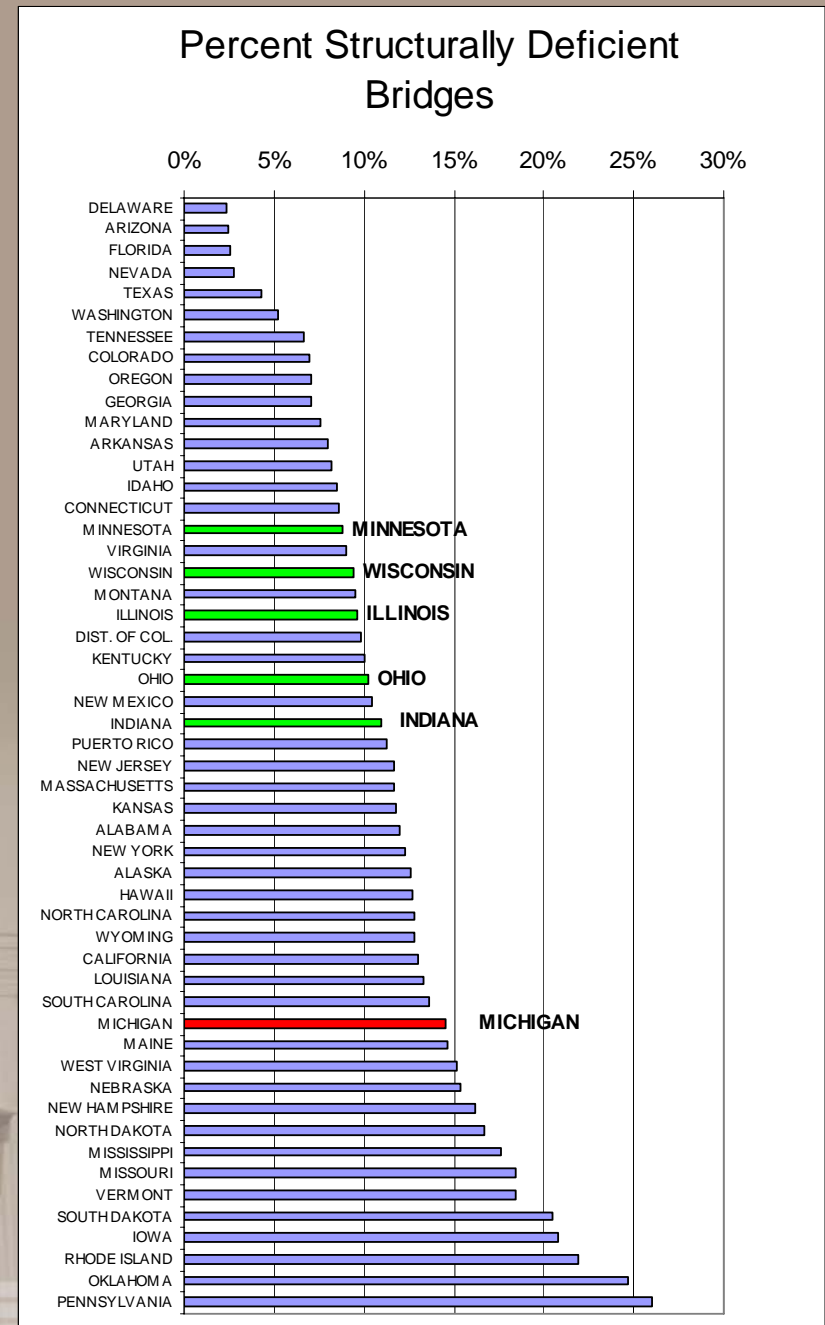


Compare Michigan Bridge Condition to All States 1998



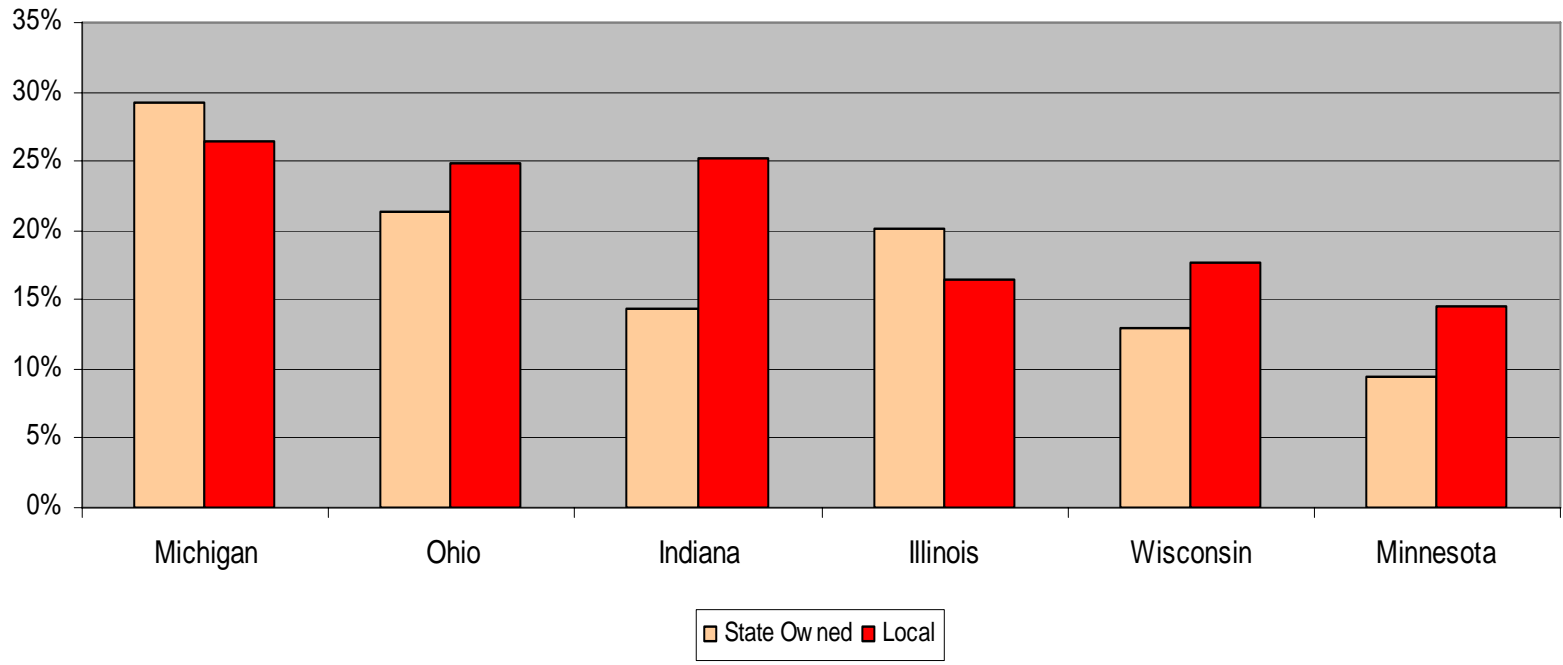
Compare Michigan Bridge Condition to All States

2008



Compare Michigan Bridge Condition to Neighboring States

Deficient (SD or FO) Bridges Great Lakes States



MDOT Bridge Preservation Strategy

- 5 Year Call for Projects
- Taking care of our worst bridges first
- Corridor Management and coordination with road program
- Statewide Mix of fixes made up of replacement (50%), rehabilitation (30%), and preventive maintenance (20%)
- Strategy is tailored for each Region

Management of MDOT's "Big Bridges"

- Complex bridges, including movable bridges, post tensioned segmental concrete bridges, and bridges with larger deck area (over 100,000 square feet) are inspected and managed by a statewide "Bridge Operations Unit" based out of Lansing.
- Goal is to always maintain these bridges in good or fair condition



Local Agency Bridge Program

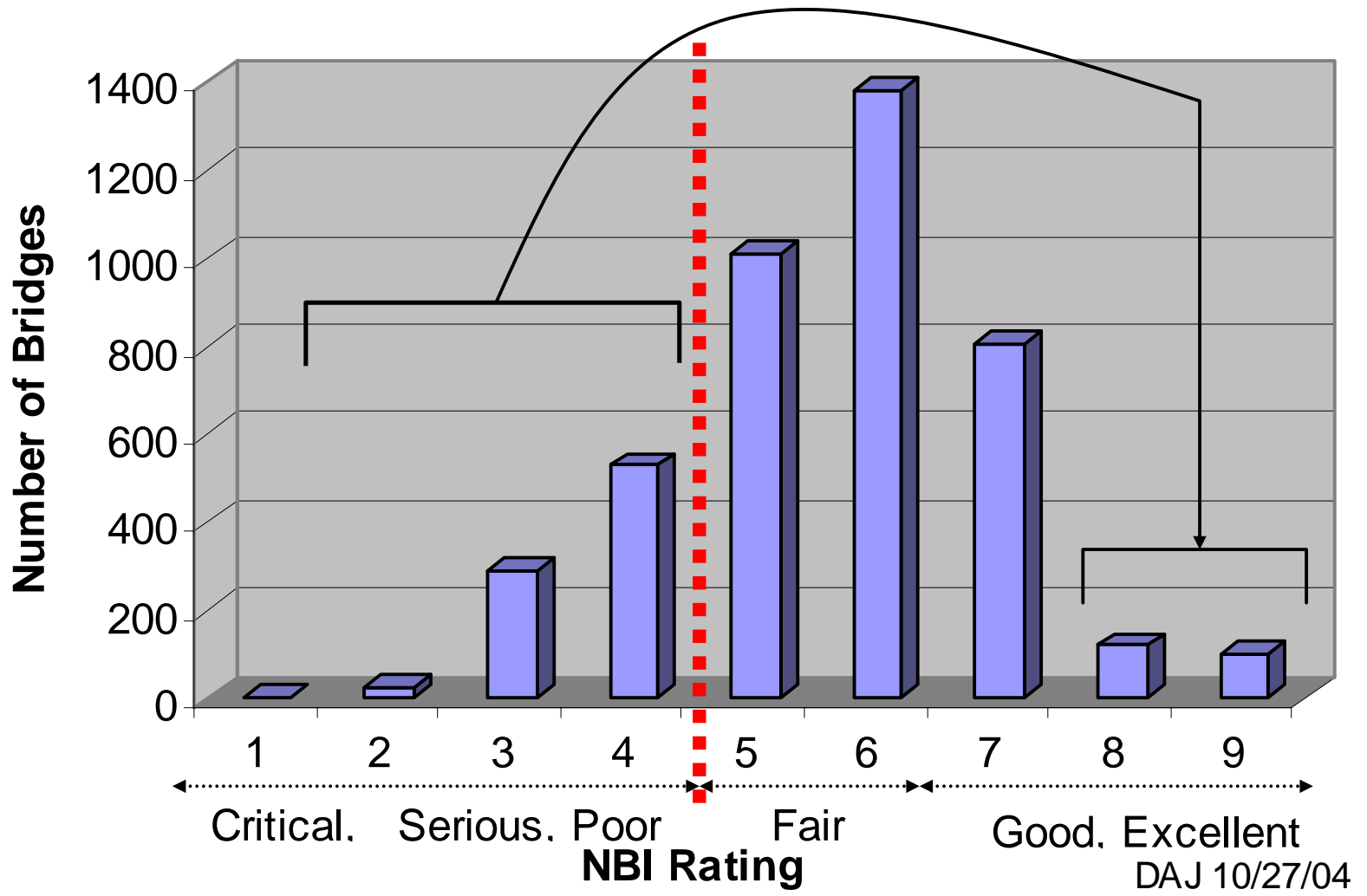
- Re-engineered in 2005
 - 3 year Call for Projects
 - Local Agency Bridge Advisory Board
 - Regional Councils
- In 2007, began to do preventive maintenance (however, still primarily a replacement program)

Replacement Projects

- Deck Replacement
- Superstructure Replacement
- Bridge Replacement



Replacement (\$1.2 - \$1.8 Million)

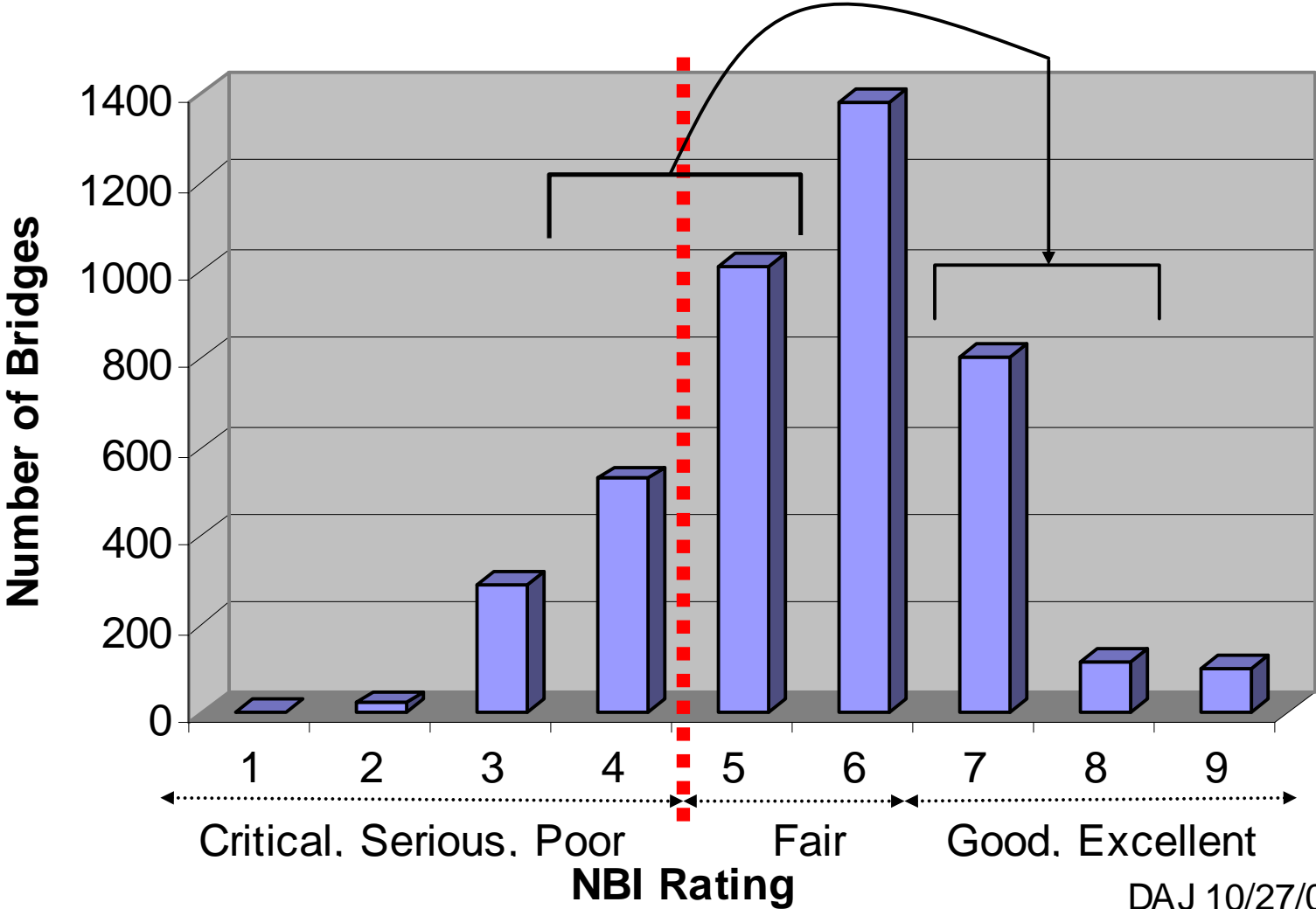


Rehabilitation Projects

- Deck overlays
- Superstructure Repairs
- Substructure Repairs



Rehabilitation (\$500 - 700 Thousand)



DAJ 10/27/04

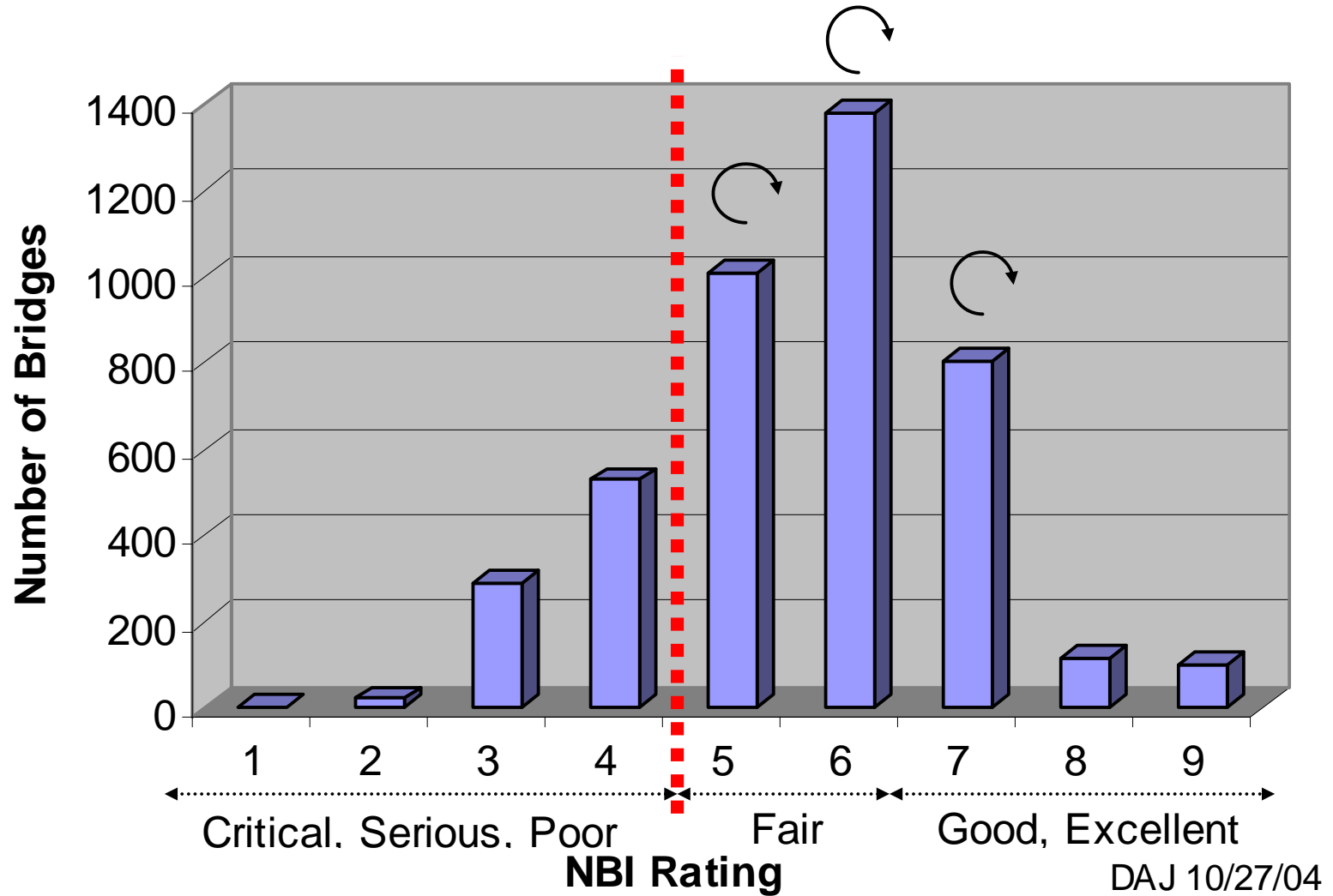


Preventive Maintenance Projects

- Joint Replacements
- Pin & Hanger Replacements
- Complete Painting
- Zone Painting
- Epoxy Overlays
- Deck Patching
- (many more)...



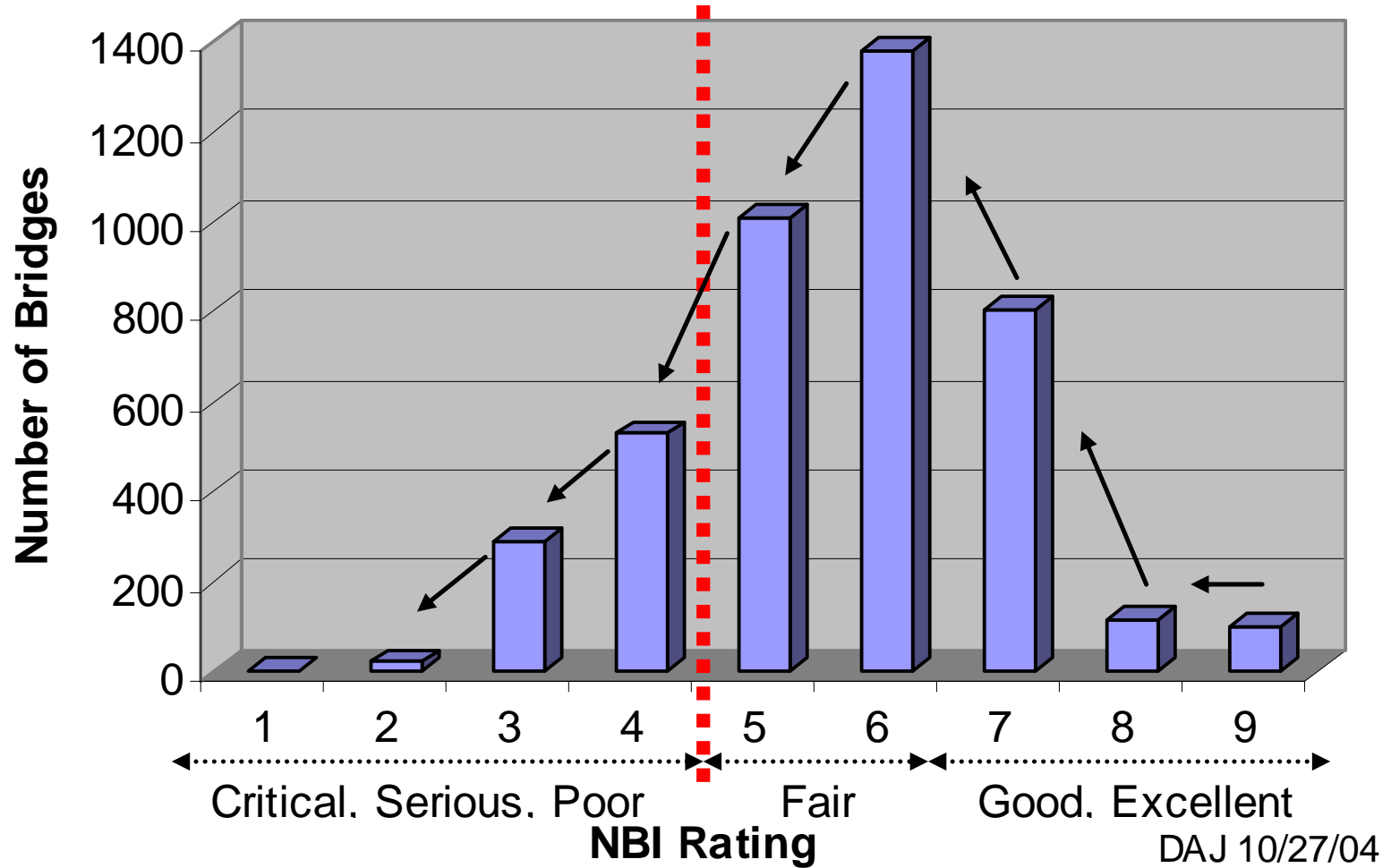
Preventive Maintenance (\$200 - \$300 Thousand)



Goals and Objectives of Preventive Maintenance

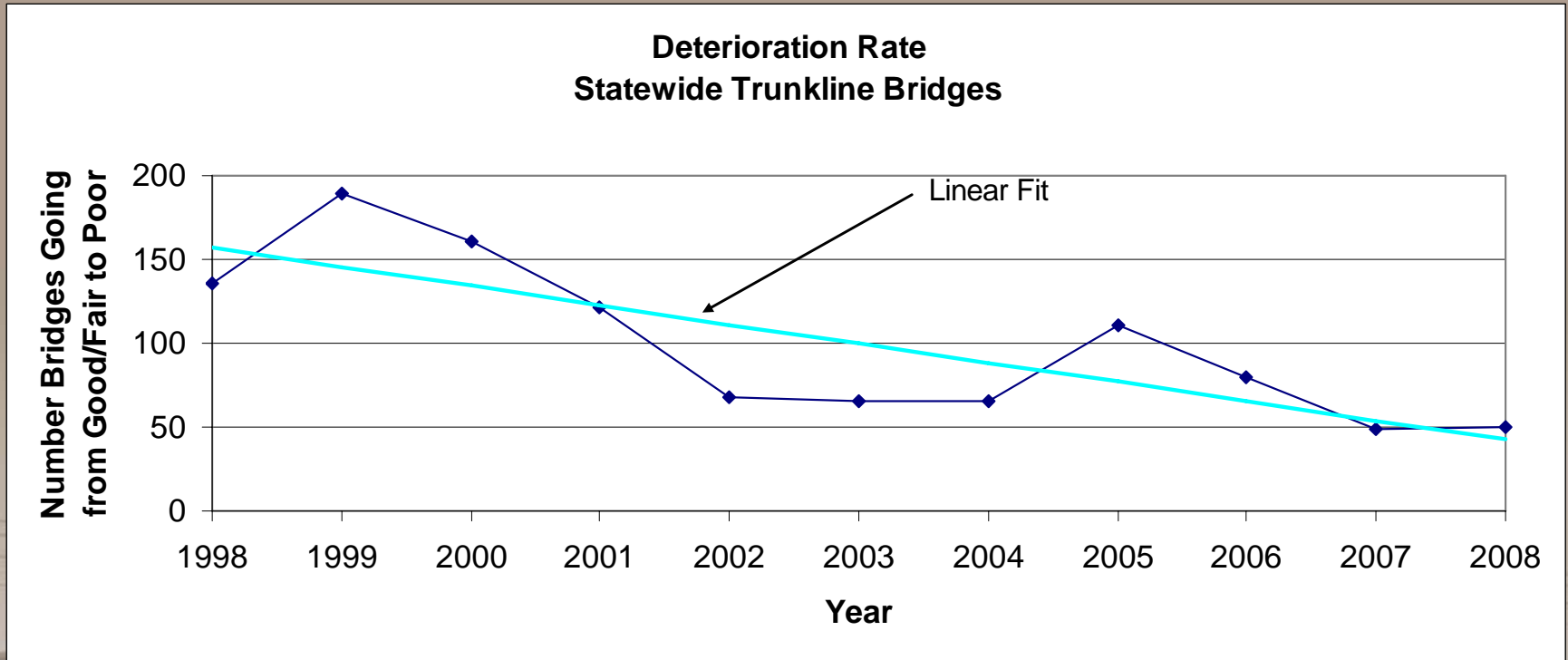
- Slow the deterioration rate of bridges and bridge elements.
- Maintain population of bridges in fair condition (prevent them from becoming poor).
 - Performance Measure – Number of bridges entering poor category.
- However, Bridges in poor and serious condition also need PM

Deterioration



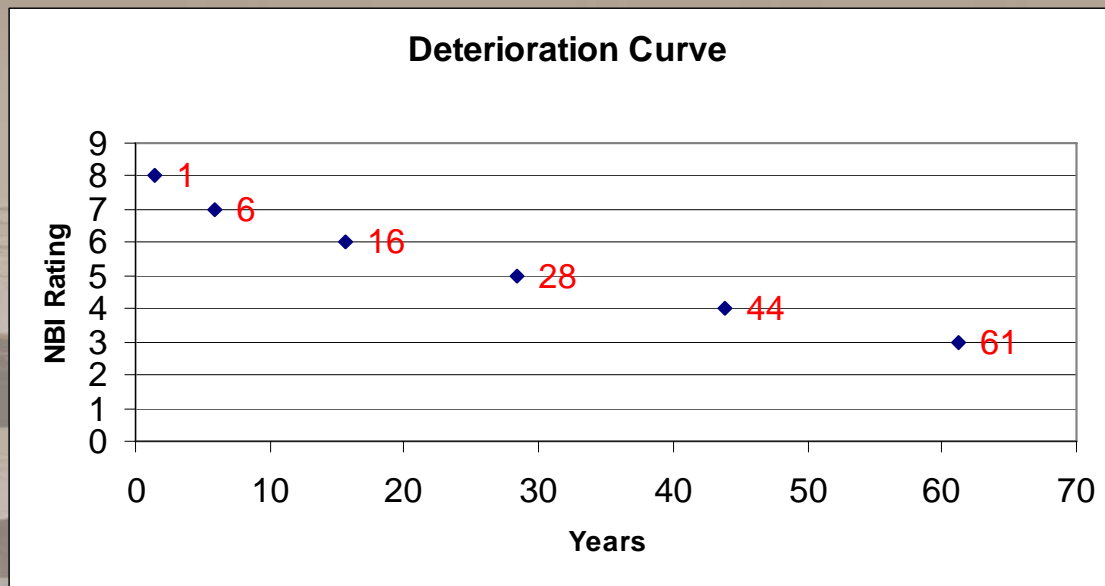
Bridge Deterioration Rate

MDOT Trunkline Bridges



Transition Probability

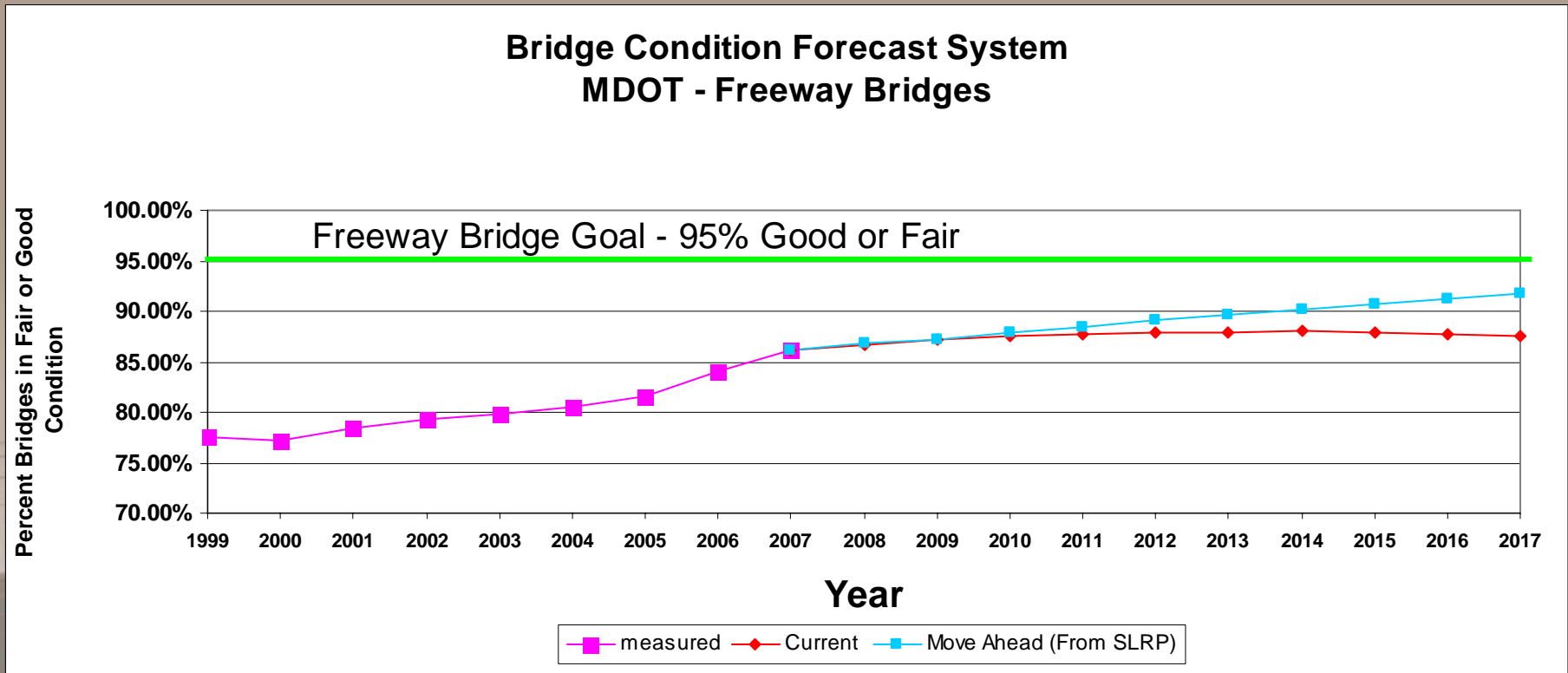
2 Year Average										
Transition Probability Matrix										Percent
	0	1	2	3	4	5	6	7	8	9
9	0	0	0	0	0	0	0.0119048	0.0599817	0.3209707	0.6071429
8	0	0	0	0	0.002193	0	0.004386	0.1367826	0.8566384	
7	0	0	0	0	0	0.0056143	0.062623	0.9317627		
6	0	0	0	0.0013423	0.0067735	0.0451204	0.9467638			
5	0	0	0	0.0037658	0.0398143	0.9564199				
4	0	0	0	0.0391865	0.9608135					
3	0	0	0.0052632	0.9947368						
2	0	0	1							
1	0	0								



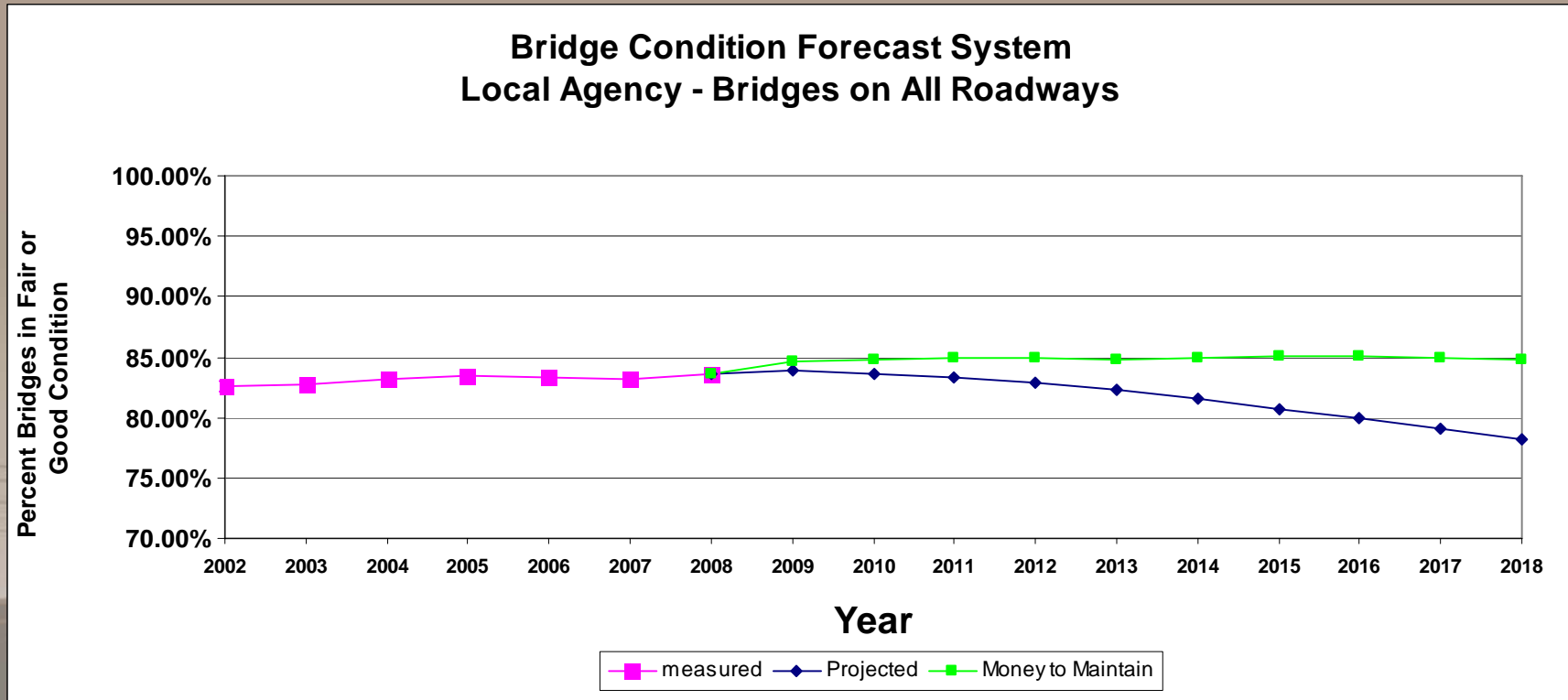
Bridge Condition Forecast System

- Evaluates different mix of fixes (PM, Rehab, and Replacement)
- Compares different yearly budgets
- Uses average cost per deck area
- Deteriorates population of bridges using transition probabilities
- User sets which bridges will be worked on and what end result is

Forecasting Condition of MDOT Bridge Condition



Forecasting Local Agency Bridge Condition



Thank You

